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ABSTRACT

Designed to provide classroom teachers with activities to enhance computer equity for female students, this kit is divided into four sections which present excerpts from four other publications: (1) "The Neuter Computer: Computers for Boys and Girls" (Jo Schuchat Sanders and Antonia Stone for the Computer Equity Training Project, Women's Action Alliance), from which teacher/parent strategies, teacher/community strategies, curriculum strategies, and special events are taken; (2) "Off and Running: The Computer Offline Activities Book" (Tim Erickson for the EQUALS in Computer Technology teacher education program at the University of California at Berkeley), from which two exercises to develop thinking skills are taken; (3) Project MICRO (Minority Computer Resource Opportunity), from which strategies to encourage girls in the microcomputer laboratory are taken; and (4) "Pathways: An Introduction to Computers--Teacher and Student Guide" (Susan Jo Russell and Patricia Campbell for the Technical Education Research Centers (TERC), from which an overview of the "Pathways" work is taken. The text is supplemented by various illustrations, and each section contains the name and address of a contact person for more information about the individual computer equity program. (EW)

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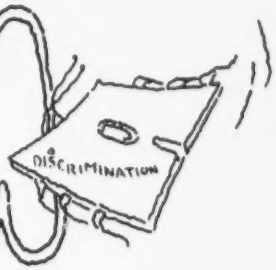
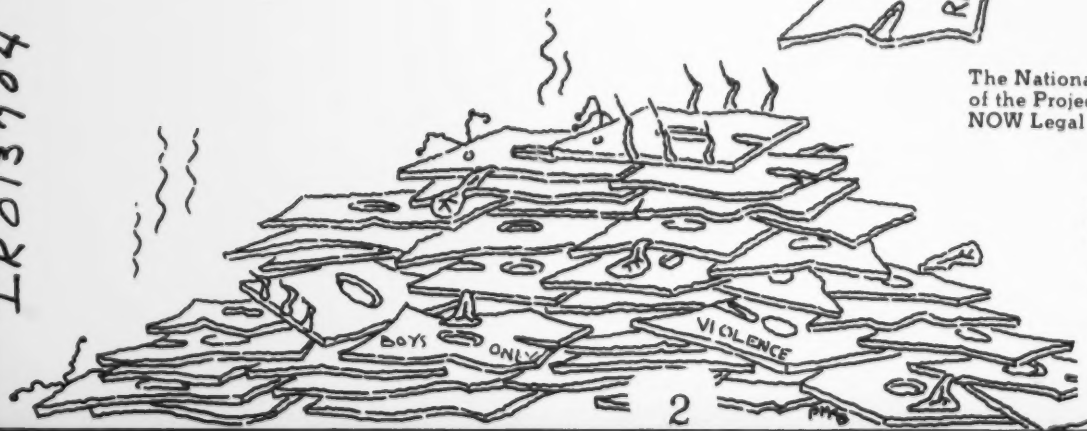


Computer Equity Strategies for the Classroom Teacher



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"Debugging the Program"—Computer Equity Strategies for the Classroom Teacher, PEER's second Computer Equity Action Kit, was written and produced by PEER staff members Arlene Fong Craig, Jennifer Tucker, Diana Hellinger, Teresa Layton, and Leslie R. Wolfe, Director.

We are particularly grateful to our colleagues who graciously allowed PEER to excerpt their outstanding materials: Jo Shuchat Sanders, Director, Computer Equity Training Project, Women's Action Alliance; Kay Gilliland, Director, EQUALS in Computer Technology, EQUALS, Lawrence Hall of Science of the University of California at Berkeley; Carol Edwards, Director, Project MiCRO, Southern Coalition for Educational Equity; June C. Foster, Susan Jo Russell, and Patricia Campbell, Technical Education Research Centers.

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Table of Contents

"Dear Teacher"—A Letter from PEER 1

From The Neuter Computer: Computers for Boys and Girls 3
(Computer Equity Training Project, Women's Action Alliance)
- Teacher/Parent Strategies
- Teacher/Community Strategies
- Curriculum Strategies
- Special Events

From Off and Running: The Computer Off Line Activities Book 15
(EQUALS in Computer Technology, EQUALS,
Lawrence Hall of Science)
- Exercises in Cooperative Logic

From Project MiCRO (Minority Computer Resource Opportunity) 21
(Southern Coalition for Educational Equity)
- Encouraging Girls in the Microcomputer Laboratory

From Pathways: An Introduction to Computers—
Teacher and Student Guide 25
(Technical Education Research Centers [TERC])
- The Green Pages—Classroom Methods

March, 1986

Dear Teacher:

This Kit is by and for you. It includes selected classroom activities developed and used by teachers and advocates who understand that equity concepts and activities must be part of each classroom's computer-based learning. We also know that overworked teachers need "hands-on," effective strategies that can be immediately implemented. And that is what this Kit offers you.

Some of these strategies have been formally field-tested *(The Neuter Computer* and *Pathways);* the others have been proven through repeated successful practice and daily observation (Project MiCRO and EQUALS' *Off and Running*). All offer pragmatic yet creative ways for you to "debug" your own computer education program and ensure equity for girls and young women, including women and girls of color and women and girls with disabilities.

Because we believe that each teacher plays a crucial role in inspiring her/his female students to excel in math, science, and computer education, PEER's *National Center for Computer Equity* is eager to assist you. We hope that this Kit will inspire and help you and that you will contact us directly for additional materials and advice.

"Debugging the Program": Computer Equity Strategies for the Classroom Teacher provides a variety of easy to use activities, with accompanying informational material. The Kit includes material from four outstanding computer equity projects; we have retained as much of the authors' language as possible, in order to convey the special quality and tone of each.

The four sections of this Guide are from:

1. **The Neuter Computer: Computers for Boys and Girls,** by Jo Shuchat Sanders and Antonia Stone, reproduced here with the kind permission of the publishers, Neal-Schuman (23 Cornelia Street, New York, New York 10014). The entire book will be available in the fall of 1986.

2. **Off and Running: The Computer Off Line Activities Book,** by Tim Erickson, reproduced here with the kind permission of EQUALS, Lawrence Hall of Science, University of California at Berkeley.

3. **Project MiCRO (Minority Computer Resource Opportunity),** by Carol Edwards, reproduced here with the kind permission of the Southern Coalition for Educational Equity, Inc.

4. **Pathways—An Introduction to Computers,** by Susan Jo Russell and Patricia Campbell, reproduced here with the kind permission of Technical Education Research Centers (TERC).

Accompanying this Kit is PEER's second Computer Equity Report, *Beyond the Star Trek Syndrome To An Egalitarian Future: "Where No One Has Gone Before,"* by Theresa Cusick, Paige Johnson, and Leslie R. Wolfe; the Report offers an analysis of the latest research and a discussion of current critical issues in computer equity.

We hope you will delve into this rich collection of activities, that you will find many that you can use at once, and that you will continue to work with PEER's National Center for Computer Equity.

Sincerely,

The PEER Staff
Leslie R. Wolfe, Director
Arlene Fong Craig
Theresa Cusick
Diana Hellinger
Teresa Layton
Jennifer Tucker

From The Neuter Computer

Chapter 9: "Computer Equity Strategies for Teachers and Staff"

The Neuter Computer is the result of the Women's Action Alliance's two year "Computer Equity Training Project," funded by the Women's Educational Equity Act Program. As described by its Director, Jo Shuchat Sanders, "the Project is based on the observation of researchers and teachers that while girls and boys of elementary school age tend to respond equally well to the computer, girls tend to lag behind in voluntary, or non-class, computer use starting in middle school.

"Research indicates that at the middle school level, boys use home computers more than girls and engage in more extracurricular use of the computer for programming and games. Studies also show that greater practice in school and at home correlates with interest in continued computer study. *The project's goal is to increase girls' computer learning and use at the middle school level by developing strategies which encourage greater voluntary use of computers.*"

The Neuter Computer provides an analysis of the "computer gender gap," instructions for planning and evaluating a computer equity program, over 40 exciting computer-based activities for girls (and boys), and over 120 strategies for parents, teachers, administrators. This Kit excerpts several types of strategies from the book:

- Teacher/parent strategies.
- Teacher/community strategies.
- Curriculum strategies.
- Special events.

As much as possible, the selected strategies do not require that students have computers at home or that the individual school or school district be wealthy. Instead, they draw upon individual and collective imagination, cooperative effort, a true understanding of sex equity and a commitment to achieving it.

Teacher/Parent Strategies

Teachers alone cannot effect changes in pedagogy and educational practice. The classroom experience needs positive reinforcement and role models on the homefront. The following strategies suggest ways that teachers can actively recruit parents as partners in this effort, thus benefitting not only the students, but educating and expanding the horizons of the parents themselves. Some of these strategies will encourage teachers to identify and utilize the personal and institutional resources within their communities.

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Strategy 28*: Invite Speakers and Role Models to School

"On the reasonable assumption that a school's faculty can't know everything about computing and its uses in the world, it makes sense to *import some expertise*. Students benefit from these contacts when their understanding of society is enriched and their potential career options broadened. When you invite speakers into classes or larger groups with girls' needs in mind, you have an *excellent computer equity strategy*.

"While it's certainly important to invite many women—half or more of the speakers, if possible—being male is not at all a disqualification in computer equity terms." Several studies on women in nontraditional occupations reveal that male teachers often had more influence on their career decisions.

*These numbers refer to the placement of the strategy in *The Neuter Computer* and are used here to assist you when you refer to *The Neuter Computer* itself.

"In making your request for an expert in some aspect of computer use, specify that a major goal is to interest girls in computers. All speakers, male and female, need to point out that many women are involved in the field and extend clear encouragement to the girls to find out more. *Be a stickler on this point: any speaker who cannot actively meet the computer equity requirement will do more harm than good.* If he or she is only "evenhanded" about opportunities for boys and girls (or worse still, neglects to mention opportunities for girls at all), the computer gender gap will be strengthened. The negative notions girls bring into school with them can only be counteracted by positive and targeted encouragement.

"The speakers you invite can range from a NASA astronaut—Sally Ride is a long shot but theoretically possible—to the business that uses computers down the street. With your colleagues, brainstorm for category ideas first: *fire fighters, detectives, airplane pilots, cell biologists, precision tool and die makers, specialists in telecommunications law,* whatever, and then work on possibilities for specific sources. Among yourselves, your acquaintances, the Yellow Pages, and back issues of the newspaper you are sure to find candidates in a good number of your categories."

Strategy 31: Computer Equity Evening for Parents

"The authors of this book have been in the business long enough to know that if you announce a program for parents specifically on the computer gender gap ('Parents: Is YOUR Daughter Being Left Out of the Computer Revolution?'), you're unlikely to get a standing-room crowd. This isn't because parents don't care about their daughters, or because they think it's right for their daughters to be left out of the computer revolution. *Parents who are unaware they are treating their daughters and sons differently when it comes to computers have no reason to believe the topic applies to them.* Without becoming aware, however, the problem is harder to solve: a catch-22.

"A computer equity strategy aimed at parents must therefore get past the 'you're not talking about me' barrier. And once you get past it, you can't be accusatory. We all tune out blame .... They may not come to a computer equity evening, but they'll come to a session on the wonderful computer opportunities available to their children in school. *Send home a notice announcing a talk by the computer teacher about the computer education program the school offers, a tour of the computer facilities, and especially computer demonstrations by their very own children."*

At the parents' evening, you also may wish to use other sections of *The Neuter Computer* that are not excerpted here; for example, "using Chapter 1 ["Is Your Computer Neuter?"] as source material, tell them about the national scope of the computer gender gap. Tell them you didn't believe it either until you saw it happening in your own school. Give them the student computer-use figures you've compiled. Have a few girls describe their feelings about computers. Have them fill out the parent questionnaire (Appendix A of *The Neuter Computer,* 'Copyables'), and publicize the results. Distribute copies of Chapter 11, 'Parent Strategies.'

"Having asked parents to bring their children, *ask parents to observe* how many boys versus how many girls actually came, or how many boys versus how many girls are clustered around the computers.

"Describe the educational and occupational consequences to their daughters if the gap isn't closed. [Use PEER's Computer Equity Report, *Beyond the Star Trek Syndrome,* as a source for this information and data.]

"Tell them about your computer equity effort and the strategies being

carried out in school. Ask for their help in encouraging their daughters' computer participation.

"A few of our schools did a computer equity evening in this manner and they recommend that you do, too. Most of the parents who came had not been aware of the computer gender gap, but having heard about it they now feel it was an important issue that should be dealt with. This is valuable support for your computer equity program in school.

"One school asked us to tell you *not* to call your session a 'Computer Open House,' as they did. Parents took them literally and drifted in and out between 7 and 10 P.M., with the result that some parents missed the computer equity part of the evening."

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Strategy 34: Parent Task Force on Computer Equity

"*Parents* who become concerned about the computer equity issue can be *powerful allies for you,* doubling your effectiveness in school by reinforcing it at home. A good way to channel their concern is by the formation of a parent task force.

"The *task force* can operate through your parent/teacher association or entirely independently. Either way, its *mission is to promote computer equity* for girls through activities carried out in or outside of school. Invite parents who seem particularly ready to help to a meeting at school early in the morning or during the evening—sorry, *not between 9 and 5: you eliminate too many working parents this way.* Duplicate as many parts of this book as you think they will need (at a minimum Chapters 1 and 11), or get them new copies. Then, aside from providing information or serving as liaison between the parent task force and your colleagues in school, stand back and let the task force help."

[For specific information about organizing a community campaign for educational equity and for encouraging parents and community groups to assess your school district's computer education program for equity, you may also wish to use PEER's comprehensive manual, *Organizing for Change,* as well as PEER's first Computer Equity Action Kit, *Programming Equity Into Computer Education: Today's Guide to the Schools of the Future.* Both are available from PEER.]

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Strategy 36: Raise Money for Computers in the Community

"Raising money to buy more [hardware or software] is a legitimate computer equity strategy *when the girls are actively involved* in the effort: the *pride* they experience when they see the hardware or software bought with money they did so much to raise encourages them to take advantage of the benefits." The following *fundraising strategies* are recommended:

- **"Hold a 'Computathon.'** If students can hold walkathons, swimathons, jogathons, and other -athons for charity, why not a computathon to raise money for computers?" They can obtain pledges for units achieved of the following:
  - pages read
  - math problems done correctly
  - miles jogged, walked or swum
  - lines of poetry memorized
  - Presidents of the United States named (in order!)
  - paintings identified by artist
  - popular songs identified by singer or group
  - yards jumped or hopped in burlap bags
  - famous persons named: mathematicians, composers, authors, astronauts, rock stars, etc.
  - dates of historical events
  - feet of rope climbed
  - drawings or paintings made

"Choose a few varied activities and have students select what they want to do." After pledges have been

obtained, hold the *Computathon events* at school a few minutes a day for a week so that students who are absent a day or two aren't left out.

"An elementary school in Oregon chose reading, math facts, and jogging for their Computathon, and *raised over $12,000* for computers." In addition, by restricting the use of computers to those in school, those students who do not have computers at home will not be penalized."

Teacher/Community Strategies

Another purpose of these strategies is to actively involve the community: first, community leaders must understand the importance of equity in computer education and then engage in collaborative efforts to achieve it. Achieving race and sex equity in education is "serious business," but the efforts to achieve it can also be enjoyable for participants. The following activities have the added benefit of engendering *esprit de corps* among the participants.

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Strategy 29: Computer-Related Field Trips

"Instead of importing the expert to the students, export the students to the expert. *Consider anyplace or anyone that uses computers:* hospitals, graphic art studios, architects, accountants, stock brokers, department stores, police stations, science museums, and nearly anything else.

"A well-planned *field trip* is often worth the hassle of setting it up because students can see the environment and the work being done with their own eyes. A *hands-on component,* even if it only means 'Hit this key, now hit that one' tends to be more impressive than simply listening to a description of what happens next. It's wise to *visit the place before the field trip* to explain your educational as well as your computer equity objectives, and to make reasonably sure they will all be met.

"By the way, *a computer exposition or fair* held in your area can be a gold mine as a field trip. Call ahead to see if you can get one of the organizers to give a special talk or if possible a guided tour to your students."

The above activity can also be an educational and enlightening one not only for your students but also for the management and employees of the places that you visit.

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Strategy 30: Computer Career Fair

"This can be a big deal to do, but on the other hand it can be the highlight of the entire school year. *A computer career fair is not only a marvelous career education activity, but it also enables you to present a smorgasbord of computer uses to students.* With the range of applications thus widened, girls have many more reasons for becoming intrigued with computer exploration.

"The computer career fair requires a team of faculty members, and preferably students as well, for the planning and preparation work. One of the schools in the Computer Equity Training Project recommends that you spend a term or more putting it together." With proper teacher (adult) supervision, the planning, implementation, and follow-up of the computer career fair provides an *excellent opportunity for a mixed group of students to not only learn HOW to 'pull off' such an event, but also how to share responsibility equitably and in a sex-fair manner.*

How well this succeeds will depend largely upon the quality of teacher guidance. We impress upon ourselves

the importance of myriad management and administration principles, the value of teamwork balanced by independent judgment, in all occupations— here is the chance to start early—the complexity of the tasks and level of effort will depend upon the age and ability of the girls and boys.

"Consider the following as *components* of your fair:

■ **"Speakers.** You can invite a speaker to talk about general computer industry career prospects, and selected occupational representatives as well." Strategy 28 ("Invite Speakers and Role Models to School"), excerpted above, provides criteria to use in selecting speakers, who can come from a variety of industries and occupations, such as:

- Accountant
- Engineer
- Architect
- Print and broadcast journalist
- Artist or designer
- Telecommunications specialist
- Dentist
- Automobile designer
- Medical professional
- Restaurant operator
- Hospital administrator
- Utilities worker (telephone, gas, and electric companies)
- Robotics specialist
- Transportation worker/manager
- Chemist
- Programmer
- Banker

■ **"Demonstrations.** Using your own equipment will simplify life, but some demonstrators will be willing to bring their own if needed. (Be sure you have adequate electrical hookups.) A computer store may agree to lend demonstration equipment as a form of advertising. *Demonstrations* can include:

- Demonstrations *by speakers of how they use computers* in their business or profession. Describe to them ahead of time the age and knowledge levels of your students to ensure that demonstrations don't go over students' heads.
- Demonstrations *by students* of creative uses of professionally developed or self-developed software. Especially *encourage girls* to do this.
- *Student tryouts* of what has been demonstrated by speakers and students, or tryouts of newly purchased or borrowed software.

"You can hold demonstrations booth-style in your gym or cafeteria, or you can disperse the demonstrations around the school by locating them in various classrooms. If the latter, you'll need a *guide* on what's where. It's best not to have demonstrations done from an auditorium stage if students are invited to participate: less confident students won't come forward, among them many girls.

■ **"Audiovisuals.** Appendix B, 'Resources,' [of *The Neuter Computer*] lists several sources of films, filmstrips, videotapes, and other audiovisuals. These can include: career education audiovisuals on computer-related careers; audiovisuals showing computer-generated special effects.

"You can show these to large groups at a time (the whole student body, individual classes) or to small groups that cluster around the audiovisual booth.

■ **"Printed Materials.** You can display books, pamphlets, posters, and other printed materials on computer careers, job prospects in high technology, computer software catalogs, hardware descriptions, and computer magazines. *Trade associations and computer stores* may have information available for distribution that students can take home .... Select printed materials that *show women* other than as passive spectators;" especially look for materials that show women in "non-traditional" careers (as bank

executives as well as word processing operators, as computer systems analysts as well as data entry clerks, etc). Be sure that *persons of color, women and men with disabilities, and older people are included.*

■ **"Pictorial Display.** You can have an exhibit on the *history of the computer industry,* as several women were major figures. You can also exhibit *pictures of women who own or manage* computer companies. Look through computer magazines for these."

Planning the Computer Career Fair requires careful organization and a core of active planners; "the following tasks need to be allocated among the planners to prepare a computer career fair: *scheduling:* dates, times, space; *contacts with presenters* (after team decision on names or types of people to invite); *publicity:* notices to students and parents, local media; *logistics:* tables, portable walls, electrical hookups, etc.; *acquiring materials:* printed materials, films, borrowed hardware and software, etc.; *refreshments?*

"Regular meetings during the planning process are important since the functions overlap considerably—the publicity person must coordinate with the presenter-contact person, for example, who must coordinate with the scheduling person. We suggest a meeting every two or three weeks, changing to weekly for the last month before the fair.

"As we said, it's a lot of work. But it's worth it."

If you and your students are really ambitious, the students can also produce a *report on the fair* and/or develop a *"how-to"* manual or *resource guide* on conducting a computer career fair, to share with students and teachers at other schools. They will use their computers at school, of course, to produce it!

[COMPUTERLESS LOGO]

Strategy 37: Involve Women's Organizations in Computer Equity

Many *national women's organizations with state and local chapters* (the League of Women Voters, American Association of University Women, National Organization for Women, National Council of Negro Women, for example) are interested in educational equity and will be eager to work with you on a *major project*—such as a computer career fair, an area computer equity conference, or a summer computer camp. You may wish to ask a coalition of these groups to co-sponsor the project by sharing in the planning and fundraising efforts.

"Pulling in an outside women's organization can also be quite useful in applying gentle pressure on an educational establishment that doesn't consider the computer equity issue very important."

The Neuter Computer suggests that "if you find yourself in either of these circumstances, contact local chapters of the following women's organizations and discuss collaboration:

- **"service organizations,** such as the League of Women Voters or the Junior League. Call the Community Affairs department at City Hall.
- **"professional women's organizations,** such as the American Association of University Women, the Federation of Business and Professional Women, or the National Federation of Women Business Owners. If you locate one, it will lead you to the others.
- **"the women's center of YWC/HA.** Look in the phone book or call City Hall.
- **"Commission on the Status of Women.** Call City Hall.
- **"Citizens Advisory Committee on Sex Equity in Education.** Call the superintendent's office to find out if there is one.

"These groups may also be to offer you volunteer time, facilities, services, advice, and/or contacts. They are good allies to have."

Curriculum Strategies

Strategy 1: Computers in your Curriculum

"There are really *two requirements* for closing the computer gender gap. One is actively *encouraging girls* to use the computer, to overcome the negative computer associations they carry into school with them. The second is making the computer an *ordinary part of the school environment*, because familiarity increases the likelihood of use.

"While it may be too optimistic to expect that the computer will soon be no more remarkable than a textbook in a classroom, the more you can *integrate it into your curriculum* the faster you will close the computer gender gap. You'll also be giving your students a powerful educational experience."

We refer you to chapters two through eight of *The Neuter Computer*, which contain "dozens of ways you can use the following kinds of software to reinforce and extend what you teach:

- Graphics
- Word Processing
- Data Bases
- Numbers Crunchers (spreadsheets and graphing programs)
- Programming Languages
- Computer-based instructional software (tutorials, drill and practice, simulations, and others)
- Telecommunications

"As you go through these chapters, we hope you see many intriguing possibilities for your students."

[COMPUTERLESS LOGO]

Strategy 6: Discuss Notable Women in the Computer Field

"As a homework assignment, ask students to do some library research that permits them to write an 'autobiography' of *Grace Hopper*, for example. Did you know that Grace Hopper designed the famous ENIAC computer (which was operated by 100 female programmers) and that she is also the creator of COBOL, the computer language that is still used for business applications? At age seventy-nine at this writing, Grace Hopper serves in the U.S. Navy as a computer consultant.

"Or students could learn about *Countess Ada Byron Lovelace*, who had a fascinating life. She was the first computer programmer, and the computer language ADA is named after her.

"Or students could do some research into more modern women achievers in the computer field. Suggest to them *Ruth Margaret Davis*, *Jean E. Sammet*, and *Pamela Toni Surko*. Steer them away from old encyclopedias and toward *Who's Who* and personal letters of inquiry.

"You might expand the field to include technology more generally, which would let you include *Sally Ride*." In fact, this might be a good idea because computers and knowledge of both applications and conceptual knowledge of computers, is an important part of an increasing number of jobs. "*The point of the assignment*, of course, is to counter the notion that only men "do" computers—an understandable notion in view of the scarcity of women presented in magazines and advertisements."

[COMPUTERLESS LOGO]

Strategy 7: Analyze Sexism in the Computer Media and Software

"Here are two eye-openers.

"Computer Magazines Analysis. Ask each student to go to the library and choose one computer magazine for adults (the library may have a dozen or more). Have them choose different issues to avoid duplication. Then have them make one or more of the following counts for the entire issue:

1. "Count the *number of men or boys* in the *pictures* and drawings, and the *number of women or girls.*" (Also observe and count the number of *minority, disabled, and older individuals*—and the quality of their pose; that is, not all older people wear chignons and sit in rocking chairs, etc).

2. "Of the males and females pictured, how many of each are shown in *active computer use* and how many are just *watching* someone else use a computer?

3. "Count the *articles* written *about men* and those written *about women.*

4. "Count the *articles* written *by men* and those written *by women,* as best as students can tell from the authors' first names.

"On the day the assignment is due, ask them to report on their results. They will be quite lopsided in favor of males. *To initiate discussion,* ask such questions as:

- "Why do you think you counted so many men and so few women? Is it because it's mostly men who are interested in computers, or because the magazines give women the message that they're not supposed to be interested in computers?
- "Let's say a girl picks up one of these magazines. Do you think the male slant is likely to affect her? If so, how?
- "Is the male slant likely to affect a boy who picks up one of these magazines? If so, how?
- "If you were the publisher of the magazine you analyzed, would you make any changes in the male/female aspect? Which ones and why?

"Software Analysis. Ask each student to go to the library and choose one computer magazine about family or recreational/educational computing. Have them choose different issues to avoid duplication. Ask them to answer the following questions for ten randomly chosen *software reviews or advertisements* they find in the issue:

1. "What is the *theme* (goal, point) of this program?

2. "Does the *program* involve any of the following?
   a. Violence
   b. Combat or war
   c. Weapons
   d. Adventure
   e. Fantasy
   f. Outer Space
   g. Sports
   h. School subjects (e.g., math, typing)
   i. Science
   j. Problem solving

3. "If there is a *central character* in the program, is the character male or female?

4. "If there is an *illustration,* does it show boys or girls? If both, who takes the active role and who does the watching?

5. "Do you think this program would *appeal* more to boys, to girls, or equally to both?

"On the day the assignment is due, ask them to report on their results. Students will probably have found a clear preponderance of macho characteristics and boys as the expected consumers of the software. *To initiate discussion,* ask such questions as:

- "Why do you think so much of the software involves violence or conflict of some sort?
- "Do you think the people who wrote the reviews or ads thought the software would appeal more to one sex or another? Why?
- "How do you personally feel about this kind of software? Is there another kind you wish were more available?
- "Would girls reading these reviews or ads find them inviting? Would boys? What would their reactions and feelings be?
- "If you were the publisher of the magazine you analyzed, would you make any changes in its software policy? Which ones, and why?

"If kids get mad after doing either of these activities, so much the better: righteous indignation—or

contrariness—can be powerful enough to make girls insist on their right to a computer, too. Maybe they can write a letter on the computer to the publishers."

Strategy 17: Student Computer Teachers

The Neuter Computer suggests having students, especially girls and young women, teach computer skills to other students because it can achieve several important purposes:

"*assistance for the beleaguered adult computer teacher;* ability to provide *more computer instruction* to students than your staff budget allows; *expanded supervisory coverage* of the computer room, at no or little cost to the school; development of *responsibility and maturity* for the student computer teacher through school service; the *visibility of girls* as computer authorities, as *role models* for other girls and attitude-changers for those boys who think that 'girls can't do computers.'

"It's a lovely strategy.

"It doesn't come free, however. Student computer teachers need to be computer-competent as well as moderately good teachers, and this requires some preparation.

"One of the schools that participated in the Computer Equity Training Project had a formal student 'licensing' procedure with defined instruction components and achievement testing, while another went about the selection process much more informally. You and your team will decide the best approach for your school. Whatever that is, be sure to *make a point of actively encouraging girls* to apply for the job. If you don't, you'll find that nearly all the applicants are male.

"Make a list of the times during the school day that the student computer teachers are available, and the times before and after school as well if such optional access is possible. *Student computer teachers can:*

"*supervise* the computer room when it would otherwise have to be closed, enabling students to use the computer for homework or fun; *assist* the adult computer teacher in class by giving more instructional time to individual students who need more help; *assist* students who are having software or hardware problems; *give actual lessons* in introductory computing to students, teachers, parents, or community members: this can be a way to raise money for more hardware or software."

The Neuter Computer also suggests (Strategy 32) that student computer teachers, "preferably girls," may be instructors in an introductory minicourse on computers for parents to be held in the evening. They suggest teaching parents about applications programs which draw attention to the utilitarian aspects of computers—word processing, database management, accounting and mathematical manipulation, for example.

Special Events

Strategy 24: Computer Awareness Day or Week

"Recognizing that computers have a way of occupying more and more of the nooks and crannies of our lives, Computer Awareness Day or Week is a good way to take stock of the prevalence, opportunities, and uses of computers. It's a valuable educational activity for all students (and faculty!), and when done properly it can also be an effective computer equity strategy for girls.

"You can focus on any or all of the following aspects of computers:

- **Modern uses,** either visible (as in libraries) or invisible (as in washing machines).
- Computer-related **careers,** either direct (as in computer technician) or indirect (as in neurologist).
- **Computer-in-society issues,** such as the ethics of unauthorized

software copying, the computer's relation to citizens' privacy rights, and computer crime.

"Any or all of the following *methods* can be used as vehicles for imparting or thinking about the information:

- Assemblies
- Films
- Hall or classroom displays
- Classroom discussions
- Student projects
- Dramatizations
- Speakers
- Brainstorming games
- Demonstrations (hands-on or not)
- Pencil-and-paper games

"How about a *role play*, where students take the roles of a software developer, a software publisher, a student who owns a copy of the software, and a student who wants one? How about a contest for the longest (but correct!) list of everyday objects that operate with computers? How about a *'Guess My Line'* game in which students must identify occupations from how computers are used in them? How about asking students to write *short plays* involving computer situations? And so forth.

"If you carry this strategy out on one day, you can suspend classes and devote the entire day to Computer Awareness, or shorten classes and devote the balance of the day to Computer Awareness, or feature Computer Awareness in each class as appropriate. If you choose to do it in a week, you can be much more thorough by devoting individual days to specific areas (Monday for graphics and computers in the telecommunications industry, Tuesday for spreadsheets and computers in the business world, etc.) A Computer Awareness strategy can be done on as modest or grand a scale as you like.

"*Computer equity enters in* when you plan the events with the girls especially, although not exclusively, in mind. Invite female speakers. Show a film about a woman in a computer career (See Appendix B, 'Resources'). Put up pictures of women using computers. Have girls demonstrate some software. Pick a girl to play the role of a hacker in a dramatization. You don't need to be heavy-handed about this, and in fact it's better if you aren't—the emphasis on females is more matter-of-fact this way, less 'Wow, look—a girl!' Girls will notice and appreciate."

Strategy 27: Summer Computer Course

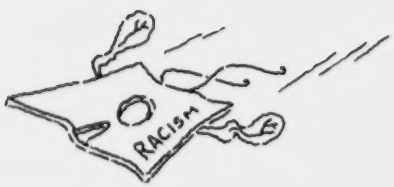
"If your school has summer courses and offers or can offer a computer course at that time, you have another strategy possibility. Teach *enrichment courses on computer topics* you have noticed that many girls like, or consisting of computer *software* that is fascinating but you don't have time for in your regular curriculum, or for a computer *project* that would take too much time during the school year. Creating an animated cartoon with computergraphics, for example, is a substantial project that might be wonderful for summertime.

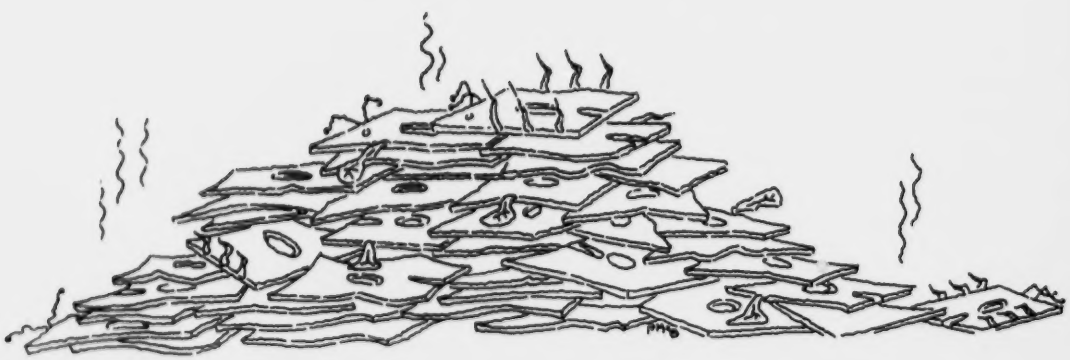
"However you choose to offer a summer computer course, be sure to *target girls explicitly*. Before school ends, give them printed information about the course(s) to take home. Talk to them personally and invite them to sign up. And for maximum success, remember to target friendship groups of girls, not individual girls."

These strategies from *The Neuter Computer* originated as ideas (many from the field) that succeeded in certain locales. You may need to modify them to the particular circumstances of your school and community in terms of geographical location, family income, ethnic diversity, students with physical disabilities, etc. The sheer number and range of strategies in *The Neuter Computer*

offers an astonishing array of ideas for teachers, parents, and community members alike.

For further information on the Computer Equity Training Project of the Women's Action Alliance and *The Neuter Computer,* contact:
Jo Shuchat Sanders
Director
Computer Equity Training Project
Women's Action Alliance
370 Lexington Avenue
New York, New York 10017
(212) 532-8330





From

Off and Running: The Computer Off Line Activities Book

Exercises in Cooperative Logic ("Arrange the Lab," "Who Has Which Computer Job?," and "Minot High School Computer System")

Established in 1977, "EQUALS is a teacher education program at the Lawrence Hall of Science (University of California, Berkeley) that focuses on helping K - 12 educators to acquire methods and materials to attract and retain underrepresented students in mathematics and computer education."

The *EQUALS in Computer Technology* division provides inservice training to teachers, and classroom strategies and materials, to assist teachers to encourage their female and minority students "to participate in computer courses, help them develop thinking skills in the areas most necessary for technical work, and to provide information and experiences which will enable them to master the new technology." The *five-day program* includes hands-on microcomputer experiences, off line activities, statistics on females and minorities in technology, thinking skills essential to the understanding of computers, software review and evaluation, classroom logistics, and career information.

The following exercises in logic—"Arrange the Lab" (two variations), "Who Has Which Computer Job?" and "Minot High School Computer System"—are two samples of the many exciting activities included in *Off and Running*. These exercises all require a cooperative effort among the members of the group; each student's clue is essential to the eventual solution of the problem.

To ensure equity, be sure that these are mixed (i.e. by sex and race and disability) group activities; it will become very clear that physical prowess and psychological intimidation cannot prevail here: only logic succeeds.

Cooperative Logic

Instructions for the exercises:
"Preparation for one group:

- Get *one envelope for each problem* you want them to solve
- *Duplicate* the appropriate sheets, one for each problem
- *Cut out* the six small sheets with the *clues* on them
- *Put the six clue sheets into an envelope. Label the envelope with the name of the problem.* If there are going to be fewer than six people in the group, you can leave out the cards with stars on them. All problems can be solved if you omit the starred cards. Alternatively, you can let the groups distribute 'left-over' cards to the players so that some of them have two.
- *Divide the class* into groups of four to six, arranged at tables or at desks pushed together.

"Rules: Explain these to the groups before you start:

- *Distribute the clues* among members of the group, one clue to each person
- Each person may read his or her clue aloud, *but may not show it to another player*
- The group is *trying to solve a logic problem together*
- The group is done only when *everyone agrees* the problem is solved

"At the start of the activity, after you've explained the rules, pass out *one envelope to each group.* When a group finishes, give it a new problem. *It is not necessary that all groups solve the same number of problems."*

Use these clues to help your group arrange the computer in the lab.

- There are six parts to the computer system: the CPU cabinet, the tape drive, the disk drive, the printer, and two terminals.
- The disk drive is north of the tape drive.

arrange the lab

Use these clues to help your group arrange the computer in the lab.

- The CPU cabinet is next to the tape drive.
- One terminal is north of the printer.

arrange the lab

Terminal

Terminal

Use these clues to help your group arrange the computer in the lab.

- One terminal is east of the tape drive.
- The lab has six spaces for computer parts. Use the floor plan to help you.

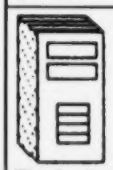
arrange the lab

Use these clues to help your group arrange the computer in the lab.

- The CPU cabinet is next to the disk drive.
- The tape drive is in one corner of the room.

arrange the lab

printer



Disk drive

Use these clues to help your group arrange the computer in the lab.

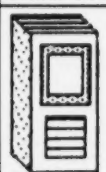
- The two terminals are not next to one another.
- Both terminals are east of the CPU cabinet.

arrange the lab

Use these clues to help your group arrange the computer in the lab.

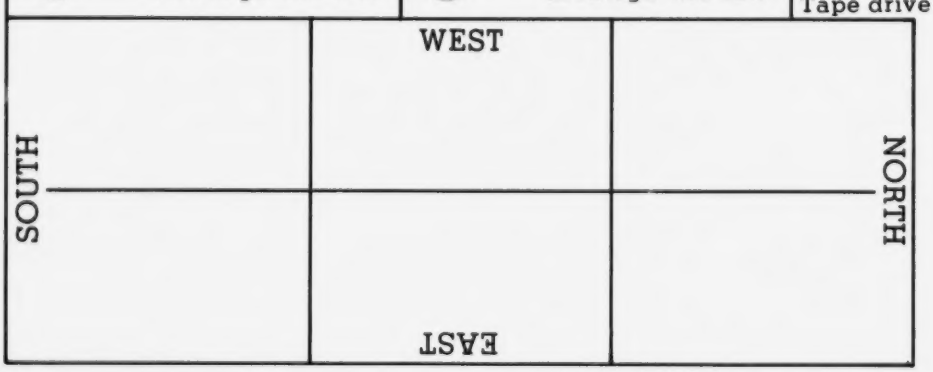
- The printer is next to both terminals.
- One of the terminals is due south of the other.

arrange the lab



CPU Cabinet

Tape drive



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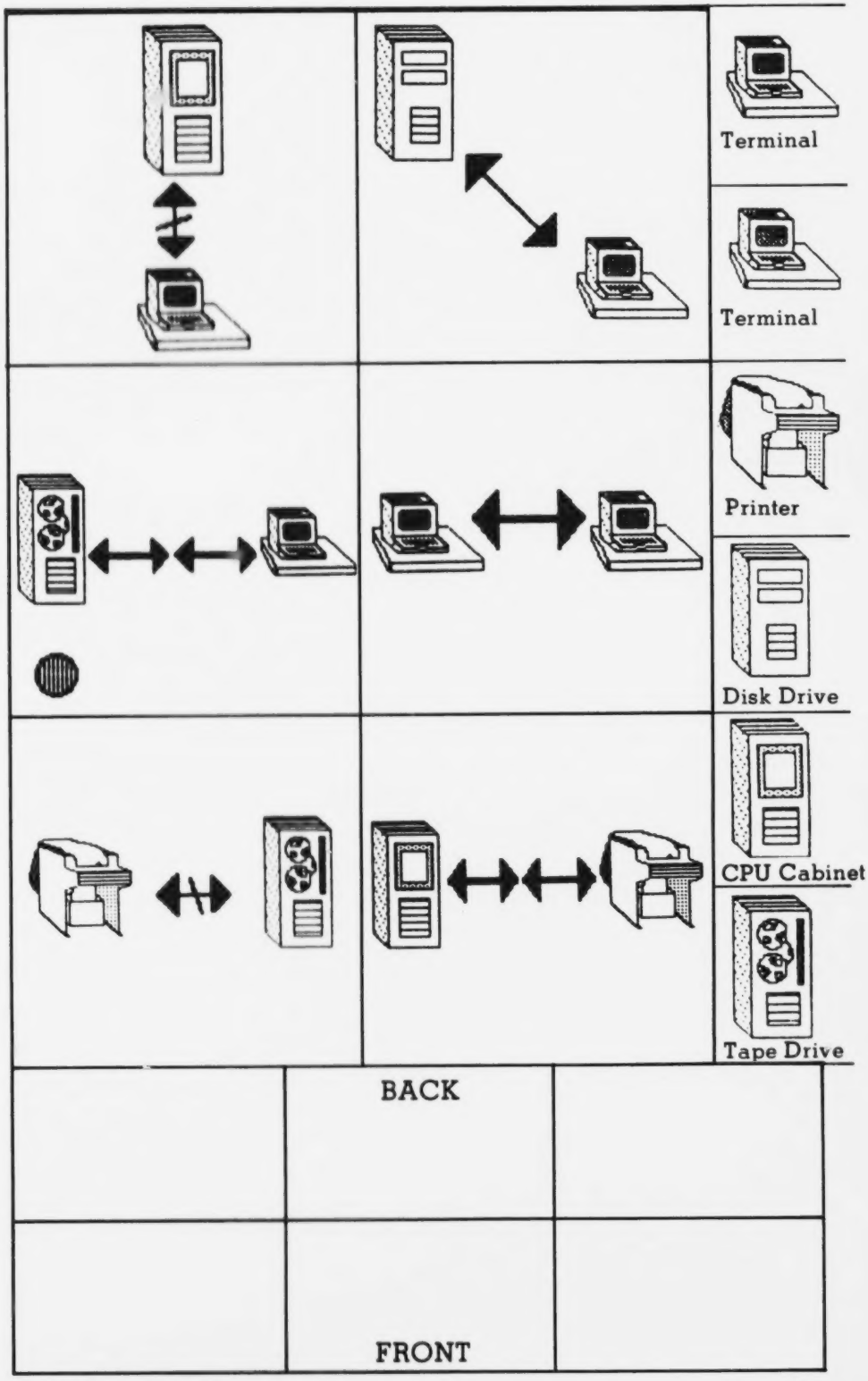

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WHO HAS WHICH COMPUTER JOB?

WHO HAS WHICH COMPUTER JOB?
These are your clues to help solve the group's problem. Read them to the group, but do not show them to anyone.

A computer programmer, computer hardware engineer, and a technican traveled together to Ohio to install a computer in a steel Mill.

Juanita and the computer programmer decided to make minor design changes in the computer installation.

WHO HAS WHICH COMPUTER JOB?
These are your clues to help solve the group's problem. Read them to the group, but do not show them to anyone.

The engineer works with Barbara whenever possible out of respect for her knowledge of computers.

The computer programmer and the engineer both admire the skill and speed of the technican's work.

WHO HAS WHICH COMPUTER JOB?
These are your clues to help solve the group's problem. Read them to the group, but do not show them to anyone.

The people who went to Ohio to fix the computer, Barbara, Robert and Juanita, have worked for the Dedicated Computer Company for eight years.

Barbara changed the connections which the computer programmer considered necessary.

WHO HAS WHICH COMPUTER JOB?
These are your clues to help solve the group's problem. Read them to the group, but do not show them to anyone.

The technician assisted Juanita in determining the source of a hardware bug.

Juanita, Robert and Barbara all liked math when they were in school.

WHO HAS WHICH COMPUTER JOB?
These are your clues to help solve the group's problem. Read them to the group, but do not show them to anyone.

Robert and the engineer decided to increase the memory capacity of the computer.

All three people love their work.

WHO HAS WHICH COMPUTER JOB?
These are your clues to help solve the group's problem. Read them to the group, but do not show them to anyone.

The computer programmer, technician, and computer hardware engineer all use math in their work.

Barbara, Robert and Juanita all went out to dinner together to celebrate when they completed the installation of the computer.

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Minot High School Computer System	Minot High School Computer System
Each employee went to Minot High School on a different day. Ahmed works weekends so that he can take Wednesday and Thursday off each week. NCSI stands for Ned's Computer Systems, Inc., a company that makes improvements to computers.	Your job, as a group, is to figure out which NCSI employee did which job on which day. Beth was sick Monday and had to stay home. The terminals were installed after the tape drive was hooked up.
Minot High School Computer System	**Minot High School Computer System**
NCSI worked on a computer system at Minot Central High School. It took parts of three days—Monday, Tuesday, and Wednesday of last week. Charlotte usually works with software but traded with Beth when Beth got sick. Ned is boss of NCSI; he is not an employee and never set foot in Minot High Shool.	NCSI had to do three things: load new software, hook up a new tape drive, and install eight new terminals. Since the new software was stored on tape, the tape drive had to be hooked up before the software was loaded.
Minot High School Computer System	**Minot High School Computer System**
Charlotte works half time while she takes classes at a local college. She works all day Monday and Wednesday, and Friday morning. Ahmed is very good at installing hardware.	Beth, Charlotte, and Ahmed are the three employees of NCSI. Beth met with Ned (the N of NCSI) most of Tuesday to plan an upcoming project at Floyd's of Fargo, a large insurance firm.

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Off and Running: The Computer Off Line Activities Book, by Tim Erickson, published in April of 1986, is available from EQUALS at the Lawrence Hall of Science, University of California at Berkeley, Berkeley, California 94720.

This outstanding book offers "a collection of activities that highlight concepts that are important when you deal with this new technology, no matter which computer you use." In addition, the particular strength of *Off and Running* is in its ability to demonstrate the importance and everyday relevance of these concepts to life "outside of computing" as well.

The book uses the device of *a mythical town and a mythical "hero"* —"Aunt Bebe and the denizens of Nedbury, North Dakota"—to carry through a story line that links the activities in a unique and intriguing way. In addition, these activities do not require the use of a computer. *Off and Running* includes activities and related discussions of *important computer-related issues*, such as the ethics of software copying and the history of computing; the book also discusses a variety of issues relating to equitable access to computer education.

We hope that these exercises have piqued your interest in the EQUALS program and philosophy and in *Off and Running*. Certainly, you will want to participate in the book's activities, such as "Aunt Bebe's Nedbury, North Dakota Road Rallyes!"

In addition, we believe that you will find that the materials from EQUALS work well in conjunction with the classroom logistics in Chapter 9 of The *Neuter Computer*.

For more information on EQUALS in Computer Technology and *Off and Running: The Computer Off Line Activities Book*, contact:
Nancy Kreinberg, Director, EQUALS
Kay Gilliland, Director, EQUALS in Computer Technology
Lawrence Hall of Science
University of California
Berkeley, California 94720
(415) 642-1823.

From Project MiCRO (Minority Computer Resource Opportunity)

("Encouraging Girls in the Microcomputer Laboratory")

Project MiCRO was established in 1984 by the Southern Coalition for Educational Equity (SCEE), a "regional, nonprofit organization working toward equity for minorities and girls in public schools." Project MiCRO is a five-year "model program to show how to teach computer literacy and thinking skills to minority and economically disadvantaged children." Project MiCRO defines "computer literacy as the ability to use the microcomputer to expand [one's] information base in order to solve problems and make decisions."

Funded specifically to develop *concrete solutions to inequity in computer education,* Project MiCRO involves students, teachers and parents in a *microcomputer laboratory at each of its three sites:* Pantego Junior High School in Beaufort County, North Carolina; Austin T. Walden Middle School in Atlanta, Georgia; and Paul L. Dunbar Middle School in Mobile, Alabama. Not only do teachers and students use these facilities as sites to learn and teach computer literacy, but parents as well may learn how to use the computer at each laboratory's parent room. Their involvement is guided by a parent coordinator who is responsible for parent outreach and training.

The following concrete strategies provided by Project MiCRO's director, Carol Edwards, have been tested by Project MiCRO in these southern schools and have been effective in encouraging girls to excel in educational computing.

Encouraging Girls

"Research has shown that *counseling* can be particularly effective in encouraging girls to pursue technology, science and math. Both *formal and informal counseling* should be used to inform girls of the opportunities, rewards and the appropriateness of computers for them. They should receive reassurance from counselors and teachers that they can be 'normal' girls if they enjoy using computers, to help them overcome some of the peer and societal disapproval they will receive. Girls who show interest should be encouraged to explore the math/science magnet or comparable high school programs. Girls should be made aware of *computer career options* when possible through the use of female role models.

"For many reasons girls do not choose *science and mathematics careers.* By leaps and bounds women are increasingly choosing careers as attorneys and business executives. According to enrollment in professional schools, however, the number of women becoming engineers is only inching upward. Computer science is one of the fields in which women are most underrepresented at advanced levels.

"To correct this imbalance it is not enough simply to provide equal numbers or minutes for girls as boys on the microcomputer. *Because girls are socialized differently from boys they need special intervention in order to gain equity.* For example, boys are more likely than girls to have played with machines at an early age. During their routine course of play they are also more likely to

have experiences which contribute to the development of spatial reasoning or first-hand knowledge of physical properties and laws.

"Early experiences make it likely that upon first entering the laboratory boys will be more comfortable with microcomputers, particularly programming, than girls. They are also likely to be more assertive in dominating the machines.

"*Although we do not expect every girl in Project MiCRO to become a computer scientist or a computer technician, we do want every girl to have the option of becoming one.* In order to preserve that option we must let girls know that:

- They can succeed in mastering technology.
- It is positive if they succeed in technology.
- They should be pro-active in pursuing technology if they have the interest.

"The *instructional staff and parents will make the difference* for girls in Project MiCRO. Through your help, girls will feel good about choosing high school science, technology and math classes that will give them the option to pursue technology majors in college or post-secondary school. *Adult encouragement through deliberate behavioral practices* has proved to be effective in insuring equity for girls. These behaviors will be expected of project and instructional staff and trainers in Project MiCRO.

"There are *three areas* in which girls can be encouraged in the use of microcomputers. They are: 1) during class time; 2) during "free" time, i.e. after school; 3) at home."

During Class Time

"*Classroom management* can be used to encourage girls to use computers equitably.

Make sure that girls get *as much time* on the keyboard.

Pairs of students at the micro should take turns entering input.

If the software displays the names of the users the person whose name appears on the screen should be using the keyboard. *(Sharing the keyboard* necessitates that the users be able to easily shift their physical position so that they are comfortably in front of the keyboard during their turn).

"*Notice* which students are monopolizing the computers.

Pair the assertive students together.

When *boys and girls* are paired make sure that the girl is using the keyboard equitably.

Pairing *girls together* may also encourage equitable use.

"Teachers should provide *positive reinforcement* for girls which is *directed at the tasks accomplished.*

For example, use "I like the way you constructed the records for your data base because it shows that you were thinking ahead," rather than "good girl" or "good job".

Avoid reinforcing boys in task-oriented ways, but girls in non-specific ways, by being *aware of your reinforcement behaviors.*

"*Avoid selecting* primarily boys to answer questions which require reasoning or problem-solving, girls to answer questions related to factual information.

Technical questions related to computing, i.e. how it works or programming, are asked of boys more frequently than girls:

Boys are sometimes given more chances to correct an answer to a question than girls.

Girls should be encouraged by asking them questions that require technical understanding or problem solving.

"*Extra assignments* in the computer laboratory should be given frequently to girls:

For example, girls might be asked to *boot the computers* before class or help a student who is having difficulty running software.

Ask girls to *preview software*.

Encourage them to enter *computer contests*.

Ask girls who have computers at home to *subscribe to computer magazines* and share them with the class, or encourage them to read computer magazines in the library.

In other words, give them the extra assignments which imply *your recognition and approval of their interest.*"

During "Free Time"

Project MiCRO suggests using a sign up sheet for computer usage during lunch time and providing an *equal number of slots* for girls and boys.

Another recommendation is for an *after school "girls' computer day" in the computer laboratory* at least one afternoon per week. Project MiCRO's experience indicates that "this activity can be particularly effective in communities where girls have been assigned the responsibility for caring for younger siblings after school. They can better persuade parents to make other child care arrangements if girls' computer day is highlighted as a special event.

According to Project MiCRO "recent research has indicated that girls like to be with their friends during free time. Since girls of this age have mostly female friends, a 'girls' computer day' would permit friends to be together.

"Girls should be encouraged to try *programming* during free time. If a *computer club* is formed in the school girls should receive one half of the slots.

"Girls should be used as *computer laboratory monitors*. They can perform duties such as signing out software and checking the computers at the close of the day. Girl monitors are important because they act as *role models* for other girls and boys in the school."

At Home

"*Parents can greatly influence the interest of girls in computers.* Research shows that it is not necessary for parents to actually be "computer experts" or be involved in computing themselves. "They must, however, provide *encouragement* and send *consistently positive signals* to their daughters."

"*Parents should do the following:*

- *Listen* when daughters want to talk about using computers. *Verbalize pride* in their accomplishments.
- *Purchase* computer magazines, a home computer, etc. for a daughter and encourage her to use it.
- *Avoid* the purchase of warlike software.
- *Enroll* daughters in computer camps and after school programs.
- *Initiate conversation* about computers with their daughters.
- Express high expectations for their daughters regarding technology, science and math.

"*Consistent encouragement* to use the computer, strong, task-oriented positive reinforcement, friendly social settings among female peers while using the computer, high expectations and good counseling from instructional staff and parents will lead to equity for girls in technology."

In a January 9, 1986 speech at a meeting of the Educational Computing Consortium of Ohio (ECCO), Project MiCRO Director Carol Edwards offered some *additional strategies* for parents, teachers and community leaders to implement, "to take advantage of technology in an equitable way." The following excerpts present some *recommendations* for both short and long-range planning:

"Educators who make *software purchasing decisions* must become well informed and assertive courseware

consumers. Vendors are in business to make a profit. The market can be driven by wise purchasing habits as well as foolish ones. Vendors also read and respond to letters from educators. *If we encounter biased software we should be writing to vendors telling them what we find objectionable.* We must work to insure that bias is included as a criterion for software purchasing at the local and state levels. We say we want more problem-solving courseware and less drill and practice. Let's reflect that in our orders.

"*Parents and community leaders especially in economically disadvantaged areas* should be participants in educational computing. I will use an example from Project MiCRO to illustrate how *parental involvement makes a difference.* We found that in one project school boys were using the lab after school more than girls. A major problem was that girls in this community had the responsibility for caring for younger siblings after school. This year we are asking parents to make some other arrangements for sibling care periodically so their daughters can use computers after school. Their involvement and understanding of the project is resulting in a successful response to this request.

"*Schools will have to reorganize to take advantage of technology in an equitable way.* Teachers must receive positive reinforcement and support for using computers in the way I have proposed and the discomforts associated with innovation will have to be minimized. For example, in implementing my suggested steps schools will almost immediately need to find ways to *increase planning time for teachers* so they can adequately evaluate and plan relevant activities which use tool software and problem-solving courseware. Without planning time it is more rewarding to teachers to stick to the familiar—worksheets, electronic or otherwise.

"*Teachers* need to be provided access to instructional ideas through interaction with colleagues, a well-stocked library, users groups, courseware catalogs and the like. They should also have access to courseware and hardware for lesson planning."

Project MiCRO is one of the few computer equity projects nationwide that focuses carefully and explicitly on both sex and race equity in educational computing. It also is the leading computer equity project targeting students and teachers in southern schools. For further information about this important program, contact:

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Director
Project MiCRO
Southern Coalition for Educational Equity, Inc.
75 Marietta Street, N.W.
Suite 308
Atlanta, Georgia 30303
(404) 522-5566

From Pathways: An Introduction to Computers—Teacher and Student Guide

(the "Green Pages")

Since its inception twenty years ago as a private nonprofit research and development organization, Technical Education Research Centers (TERC) has conducted well over 100 projects in curriculum development, teacher training, software development in science and mathematics, use of microcomputers by students with specific learning disabilities (including development of science software), curriculum and program development in special education, and equity in computer education. TERC also developed a model program for nontraditional occupational training in the skilled trades and crafts for community college women.

Pathways: An Introduction to Computers, funded by the Women's Educational Equity Act Program, is an *applications-based software package* and accompanying *slide tape* which introduces computer education to children in *Grades 4 through 7*. It exposes the students to the computer's broad range of capabilities—including problem solving, language arts, logical thinking, spatial visualization and modeling, and playing and creating.

Written by Susan Jo Russell and Patricia Campbell, the *Teacher and Student Guide* includes three sections:

- **1. Overview of Pathways**—the Yellow Pages of applications and equity, and a discussion on equity in computer education;
- **2. How to use Pathways**—the White Pages, a software program with accompanying slide tapes for audio-visual presentation; and
- **3. Classroom methods for Pathways**—the Green Pages, describing *effective classroom strategies* for ensuring equity in computer education. The Green Pages include *specific guidelines* for evaluating software for both educational value and equity, listings of other resources, and practical solutions to equity problems ("Tips for Increasing Equity in Computer Education").

The strategies from the Green Pages that are excerpted here are particularly useful because they take into consideration the kinds of peer pressure, support, and role modeling that especially influence middle school girls and boys (in grades four through seven).

The Green Pages will give you ideas for introducing computers to students through a broad range of experiences and will help you to debunk the view that computers are male or "hacker" territory. These practical strategies will help you ensure that all of your students—not just the confident or aggressive ones—get adequate or equitable time on the computer.

The Green Pages are largely based on the premise that computers should be integrated into the curriculum and that each student must "find the path that [she or he] would like to follow ... find the computer uses which suit her or his individual style, needs and interests ... and, therefore, become an informed and thoughtful computer user."

The Green Pages: Equity in Computer Education

"Who is Using Computers?"

"*Student interest in computers* is growing even faster than the numbers of computers available in schools. Every teacher who uses computers has stories about those students who will do just about anything to get time on the computer. Yet the characters in most of these stories, and most of the school's computer-using students, are often male. Even though half of the student population nationwide is female, *over two-thirds of the students learning about computers in high school courses are boys.*

"The students who spend most of their *free time* working with computers are overwhelmingly male. Parents buy more *home computers* for their sons than for their daughters and are anywhere from three to eight times more likely to send their sons to *computer camps. So, boys have more access to computers at home and are more likely to come in before school or stay after school to work on the computer.*

"*Equity at the computer is not only an issue for girls.* There is evidence that *minority* students, *bilingual* students, students with *special needs*, and students from *low income* families have similar problems in gaining access to the computer. In some cases, although computers are used with all students, some students are *encouraged* to use the computer in a variety of ways—applications, art, programming, discovery learning, and problem solving—while students who are seen as less able use the computer only for practice and drill in basic skill areas.

"*Equity in computer use and access will not take care of itself.* Unfortunately, *stereotypes* about the computer and students' own stereotypes about themselves interfere with many students' use of the computer—as a tool for education, recreation, artistic expression, organizing information, and solving problems. What are some of the *problems* which reinforce stereotypes about who uses computers? *How can we solve them?*"

Tips for Increasing Equity in Computer Education

"**Problem**: Students are introduced to computers through a *narrow range of experiences* (e.g., only through programming, only in mathematics, only with drill-and-practice games).

"**Solutions**: Give students experience with many types of applications, educational games, and problem solving software.

- The *Pathways* software will start you off in some of the possible directions with its package of games and tools.
- There are many ways to *integrate computer applications into your curriculum* by using tool programs (word processors, data bases, spreadsheets, telecommunications), problem solving materials (simulations, Logo), creative tools (graphics tablets, music software). Others which we don't even know about yet will undoubtedly appear on the scene.
- Plan for *alternatives through the grades.* So often we present our students with a general introduction to the computer, but then *for students who want to continue* we only offer programming, mathematics, or business applications. What about the student who is most interested in poetry or art, social science or history? Programming is not the only tool the computer has to offer either in school or in the world of work.
- Be aware of built-in bias in the *content of software.* Some educational software is based on traditional male interests—baseball, vanquishing enemies, shooting down space ships. Try for programs that don't depend on such stereotypic appeal, that provide opportunities for cooperation, and that deal with content and tools that are equally new to both boys and girls."

"Problem: Computers are viewed as "male territory" or as the province of hackers.

"Solutions: Bring students into contact with computer users who are female and male, of different ethnic groups, as well as those who are disabled. The *Pathways* slide-tape show will start you off in the direction of *exposing your students to a variety of computer users.*

■ Follow up on the showing of the slide-tape. *Invite some computer professionals* to come to your class. The Association of Women in Computing can help you find women in your area.

■ Since *advertising* plays such a powerful role in maintaining, if not generating, stereotypes about who uses computers, you might want to deal with this issue directly with your class.

■ *When computers are introduced,* be sure that both boys and girls are helpers in setting up, caring for software, and teaching other students. This is a straightforward, but potentially powerful, strategy for helping students feel responsible and competent around computers.

■ Some students have had more computer experience *outside of school.* If those with more experience are put in charge, the gap is only widened. In the beginning, give more time to those who are unfamiliar or uncomfortable with computers.

■ *Use older female students as teachers.* In other fields, such as mathematics, it has been shown that older peer role models are *more effective* than adult female role models in encouraging girls' interest and enthusiasm."

"Problem: When *computer access is limited,* more aggressive or more confident students may get more access.

"Solutions: During school hours, set up a *schedule* so that every student gets adequate time on the computer (or, if not adequate—in most schools no students get adequate time—then at least equitable!). *Have students participate* in deciding how the schedule will work.

■ *Monitor out-of-class,* not just in-class, computer time. If before school, after-school, or recess computer time is dominated by boys or by a particular group of students, other students may feel unable to break into this group even though they might like to.

■ In one school, *software* was carefully selected and rotated for *free-time computer use* in order to attract both boys and girls, both computer hackers and computer users with other kinds of interests.

■ In another, an *all-girls after-school computer club* was established because the existing computer club was all boys.

■ You will choose the solutions appropriate for your own situation—but the point is to *keep alert about what goes on after the bell rings.*

■ Make sure more confident students do not 'hang around' while less confident students are learning to use a piece of software. Counter 'I'm just watching' arguments with a firm 'sorry, watchers are not permitted.'

■ Make sure students in a team *alternate using the keyboard.* Sometimes the student using the keyboard controls decision-making. On the other hand, sometimes students are relegated to the role of typist while other students give the orders.

■ Some *software* will appeal to less aggressive students. Have some *out-of-class computer time* limited to use of particular software that will attract students with interests not always associated with technology (e.g., art, poetry, history)."

Evaluating Software for Educational Value and Equity

"Many forms have been generated for evaluating educational software. Some of these forms are extremely useful ... However, *almost every form we have tried to use is in some way*

inadequate or inappropriate. As software changes and evolves, the old forms will no longer cover new types of software. In addition, most of the evaluation forms, if they pay attention to *equity concerns* at all, contain a single question, such as, 'Is there any sexism or racism in the content or packaging of the software?'

"We believe that equity and educational concerns are not necessarily best addressed by using a prescribed format, but that there are *certain areas which should always be considered.* We list these areas below, believing that you will bring your own judgment, concerns, and knowledge (both of content and of those who will use the software) to the evaluation job within each of these areas.

"Violence/Nonviolence. Ships, people, aliens, even frogs have been destroyed in the name of fun and learning. If the only way a piece of software can keep a user's interest is by destroying or being destroyed, the software has little to offer. Besides the message being communicated about acceptable objectives, *many children are not attracted by software which has, as its major activity, shooting something down.*

"Type of Rewards and Feedback. What kind of feedback does the software give about *success and failure*? Are all the rewards related to areas such as *team sports* (e.g., getting a home run) or violence (e.g., shooting an enemy)? Making a basket, a touchdown, or a home run are fine as rewards—but they also provide *little incentive* for someone not interested in these sports to use the software. *Such software makes a statement about who should and shouldn't be using computers.* Are some of the rewards *internal*, relating to satisfaction on the part of the user, or is the software completely dependent on *external rewards* (e.g., the computer decides if you are right or wrong)?

"Passivity/Empowerment. One of the *most important ideas* that young people can learn is that they can, and should, have *control over and responsibility for* areas that affect them; they have the power to change things. Computer software can either reinforce or deny that view. In a *good piece of software*, users should have some control, be able to set some of the limits, and make decisions about what to try.

"Software that tells the user what to do, waits for the user to do it, and then judges the result may teach facts but it also teaches that the *computer is in control. Software that gives the user some control* can also teach while it encourages decision-making and fosters the concept that *people control computers*, not vice versa.

"Competition/Cooperation. In much computer software, competition makes the world, and the software, go round. Users compete against each other, the computer, and/or imaginary characters. Competition is often fun, but it shouldn't be the only model offered young people. Look for software that *encourages cooperation*, in which users have to work together to solve problems.

"Failure/Success. Most *video games, and the educational software based on those games*, give a message that 'success is impossible.' You can *stave off defeat* for longer and longer periods, but sooner or later the alien will shoot you, the ghost will eat you, or you will crash. You work not for success but to hold off failure for as long as possible.

"The message that you can never really succeed is one that young people, particularly young women, minorities and children with special needs get far too often. *Look for software that gives the user the chance to solve a problem or create something successfully* and which incorporates many different types and levels of success.

"Overall Content. Some software is related to specific content areas, while other software provides tools which can be related to many different areas. Check the software being used in your school to ensure that a *variety of topic and content areas* is covered. An emphasis on using the computer largely for mathematics, for instance, may discourage math anxious students from using the computer at all.

"Graphics. Most software has a variety of graphics or visuals to make the software more interesting. Because of the graphics limitations of many microcomputers, drawings tend to be representational rather than realistic. This can easily lead to *stereotypes. Check the drawings for stereotypes* (e.g., Asians represented by slanted lines for eyes) or unequal amounts of detail.

"Language. Just as language in books can affect perceptions, so can language in software and the accompanying print materials. Check to make sure that *male pronouns are not used* when referring to women and men, that *language of different ethnic groups* is not oversimplified (e.g., Native Americans saying "ugh" or "how"), and that *words* in the program do not insult the user.

"Packaging. While what is on the disk is much more significant that what is on the package, the *package gives an important first impression* about the software and who should use it. Are girls or minorities portrayed in stereotypical ways or omitted entirely?

"People. The same concerns we have for the ways that people are —and are not—portrayed in textbooks hold for computer software as well. Although much software does not have "characters" it is important to *be aware of who the characters are in the software* you have available. Are there characters of *both sexes*? Are the characters *ethnically diverse*? Is one sex *active* while the other is *passive*? Are *minorities* included only as 'natives' or do they appear in a variety of roles? Look for *older characters* and how they are portrayed. Basically, take all that we have learned over many years of evaluating books and, where appropriate, apply it to software."

Students with Learning Disabilities

For a more detailed discussion of computer equity issues for students with learning disabilities, you may wish to read an article by TERC staff associates, Janice R. Mokros and Susan Jo Russell, entitled "Learner-Centered Software: A Survey of Microcomputer Use With Special Needs Students," *Journal of Learning Disabilities*, March 1986.

TERC's efforts on computer equity—particularly their successful software development—focus much-needed attention on the combined impact of sex, race, and disability bias. For additional information about TERC's programs, including information on how you can gain access to the *Pathways* software, contact:

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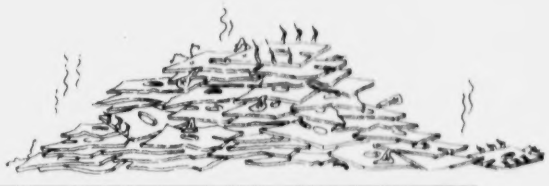

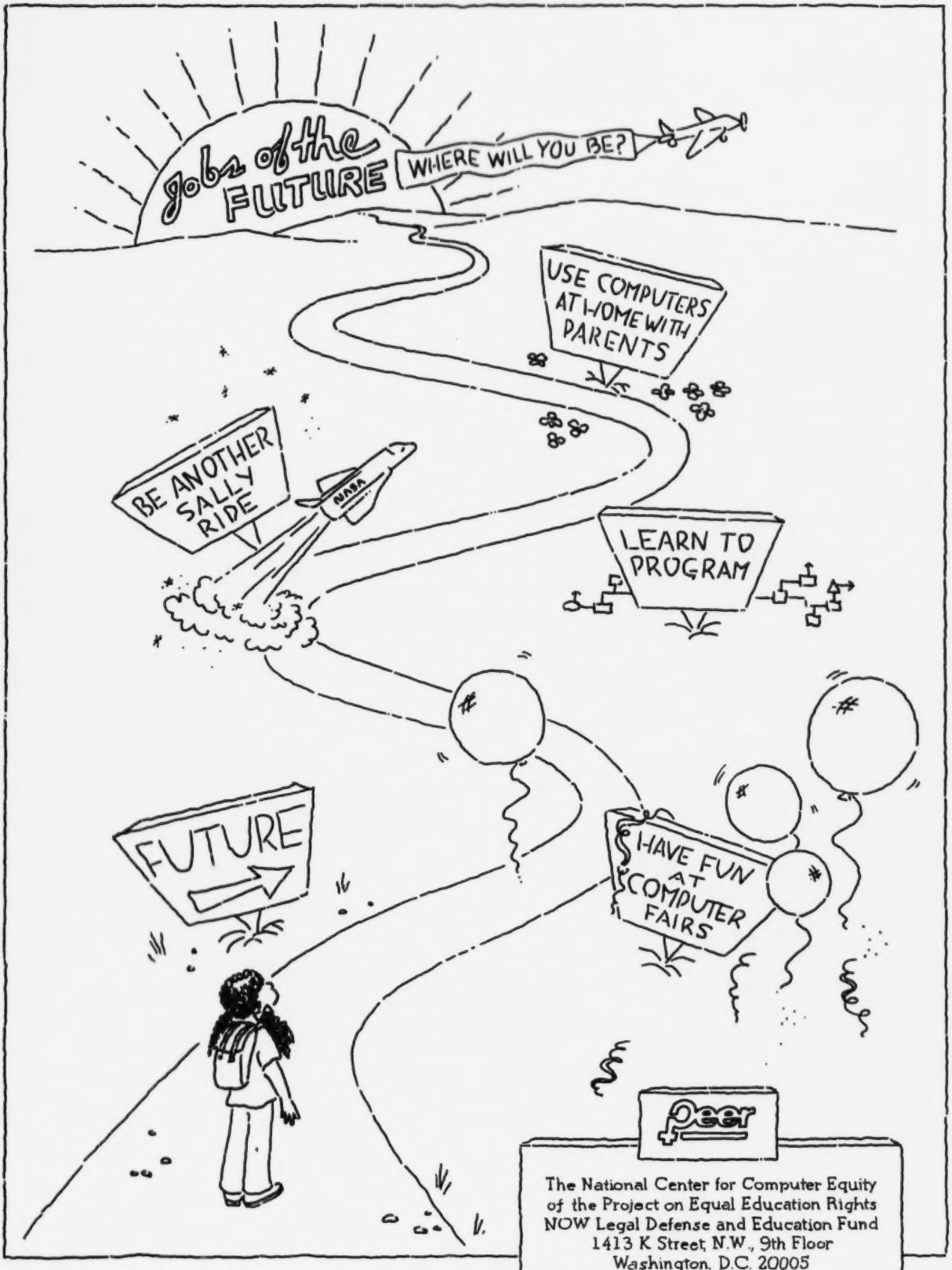

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